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**IDENTIFIERS** \*Quinmester Program

## ABSTRACT

The course helps students determine types of repairs, compute repair sizes, and complete the repair through surface protection. Course content includes goals, specific objectives, protection of metals, repairs to metal skin, and honeycomb structure repair. A bibliography and post-test are appended. A prerequisite for this course is mastery of the skills covered in the course "Aircraft Assembly and Surface Repair 1". (NH)

AUTHORIZED COURSE OF INSTRUCTION FOR THE

# QUINMESTER PROGRAM

DADE COUNTY PUBLIC SCHOOLS

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## Course Outline

SHEET METAL WORK 3 - 9857  
(Aircraft Metal Skin Repair and Honeycomb Structure Repair)

Department 48 - Quin 9857.02

DIVISION OF INSTRUCTION • 1974

DADE COUNTY PUBLIC SCHOOLS  
1450 NORTHEAST SECOND AVENUE  
MIAMI, FLORIDA 33132

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county office of  
VOCATIONAL AND ADULT EDUCATION

## **THE SCHOOL BOARD OF DADE COUNTY**

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**Miami, Florida 33132**

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### Course Description

<u>9857</u>	<u>48</u>	<u>9857.02</u>	<u>Aircraft Metal Skin Repair &amp; Honeycomb Structure Repair</u>
State Category Number	County Dept. Number	County Course Number	Course Title

This is an advanced quinmester course which will include determining types of repairs needed, computing repair sizes and completing repair through surface protection. Understanding honeycomb construction and repair, will also be covered. This is a three quinmester credit course.

Indicators of success: Prior to entry into this course, the vocational student must display mastery of the skills indicated in Aircraft Assembly Riveting and Surface Repair 1 (9855.02).

Clock Hours: 135

## **PREFACE**

The following course outline is a second quinmester course and will serve as a guide to the instructor teaching in the field of advanced sheet metal work.

Prior to entry into this course the student must display mastery of the skills indicated in Aircraft Assembly Riveting and Surface Repair 1 (9855.02).

This course is composed of four blocks of instructions, which are further subdivided into several units each, requiring one quinmester of 135 hours. Emphasis is placed on the use of visual aids, mock-ups, cut-aways, transparencies, films, instructional sheets and manipulative shop practice.

Upon completion of this course the student will have a basic understanding of types of repairs needed on aircraft metal skin, honeycomb construction and honeycomb repairs.

This outline was developed through the cooperative efforts of the instructional and supervisory personnel, the Quinmester Advisory Committee and the Vocational Curriculum Materials Service, and has been approved by the Dade County Vocational Curriculum Committee.

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Corrosion of Aircraft Metals. . . . .	1
Applying Corrosion Preventatives. . . . .	1
II. REPAIRS TO METAL SKIN (75 Hours)	
Making Sheet Metal Skin Repairs . . . . .	1
Making Repairs Requiring Juggling . . . . .	1
III. HONEYCOMB STRUCTURE REPAIR (45 Hours)	
Repairing Honeycomb Material. . . . .	1
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## GOALS

The student must be able to demonstrate:

1. The skills and knowledge necessary to make aircraft metal skin repairs.
2. The skills and knowledge necessary to perform and apply metal protection.
3. The ability to identify honeycomb materials and to make general honeycomb repairs.
4. The ability to properly interpret F.A.A. regulations pertaining to sheet metal and honeycomb repairs.
5. Ability inherent to the proper attitudes which will make him a desirable employee in industry.



## **SPECIFIC BLOCK OBJECTIVES**

### **BLOCK I - PROTECTION OF METALS**

**The student must be able to:**

- 1. Identify and state the different types of corrosion affecting aircraft metals.**
- 2. Exhibit the ability to remove corrosion from aluminium and steel.**
- 3. Demonstrate the ability to apply corrosion preventative materials on aircraft metals.**

### **BLOCK II - REPAIRS TO METAL SKIN**

**The student must be able to:**

- 1. Exhibit the ability to make general repairs on aircraft metal skin.**
- 2. Demonstrate the ability to make repairs requiring joggling.**

### **BLOCK III - HONEYCOMB STRUCTURE REPAIR**

**The student must be able to:**

- 1. Exhibit the skills and understanding needed to do honeycomb structure repairs.**
- 2. State the various methods of repairing damaged honeycomb material.**
- 3. Exhibit the ability to identify the materials needed to make honeycomb repairs.**

### **BLOCK IV - QUINMESTER POSTTEST**

**The student must be able to:**

- 1. Satisfactorily complete the quinmester posttest.**

## **Course Outline**

### **SHEET METAL WORK 3 - 9857 (Aircraft Metal Skin Repair and Honeycomb Structure Repair)**

**Department 48 - Quin 9857.02**

#### **I. PROTECTION OF METALS**

- A. Corrosion of Aircraft Metals**
  - 1. Types of corrosion
  - 2. Removal from aluminium
  - 3. Removal from magnesium
  - 4. Removal from steels
- B. Applying Corrosion Preventatives**
  - 1. Paints and primers
  - 2. Electroplating metal surfaces
  - 3. Metalizing metal surfaces

#### **II. REPAIRS TO METAL SKIN**

- A. Making Sheet Metal Skin Repairs**
  - 1. External skin patches
    - a. Round
    - b. Square
    - c. Oval
    - d. Rectangular
  - 2. Flush Skin Patches
    - a. Round
    - b. Oval
    - c. Square
    - d. Rectangular
- B. Making Repairs Requiring Joggling**
  - 1. Joggling the doubler
  - 2. Attaching doubler to adjoining members
  - 3. Inspecting repairs in accordance with repair manuals

#### **III. HONEYCOMB STRUCTURE REPAIR**

- A. Repairing Honeycomb Material**
  - 1. Inspecting damaged area
    - a. Stub meter
    - b. Tap hammer
    - c. Nitric acid test
  - 2. Classifying damages
    - a. Class I
    - b. Class II
    - c. Class III
    - d. Class IV

- B. Repairable Damage to Honeycomb Material
1. Checking necessary safety precautions
  2. Making repair to area of minor damage
  3. Making repair to area of major damage

IV. QUINMESTER POSTTEST

**BIBLIOGRAPHY**  
**(Aircraft Metal Skin Repair and Honeycomb Structure)**

**Basic References:**

None

**Supplementary References:**

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ment Printing Office, 1969. Pp. 414.

**A P P E N D I X**  
**Quinmester Posttest Sample**

## QUINMESTER POSTTEST

Name \_\_\_\_\_ Date \_\_\_\_\_ Score \_\_\_\_\_

### Multiple Choice Test Items

Each statement needs a word, a figure, or a phrase to make it correct. Only one of the choices listed is correct. Place the letter of the choice you make in the space provided at the left edge of the sheet.

- \_\_\_\_\_ 1. Electrolytic corrosion is usually caused by:
  - a. Improper ground
  - b. Static electricity
  - c. Two dissimilar metals
  - d. Too high a voltage
- \_\_\_\_\_ 2. Spilled battery acid from a nickel cadmium battery is neutralized by:
  - a. Aviation gas
  - b. Mineral spirits
  - c. Boric acid
  - d. White gas
- \_\_\_\_\_ 3. Aerobic bacteria feeds on:
  - a. Rubber fuel cells only
  - b. Fuel cells sealants
  - c. Jet A fuel only
  - d. Oxygen
- \_\_\_\_\_ 4. Corrosion can be controlled to a minimum if you:
  - a. Keep aircraft clean and dry at all times
  - b. Keep aircraft in the hanger
  - c. Inspect aircraft annually
  - d. Ground the aircraft at all times
- \_\_\_\_\_ 5. The emphasis on corrosion control should be on:
  - a. Annual inspection basis
  - b. Preventive maintenance basis
  - c. The manufacture of the aircraft
  - d. All of the above
- \_\_\_\_\_ 6. Exfoliation can be detected:
  - a. By its dark blue color
  - b. By its ability to be peeled off in scales or flakes
  - c. By magnafluxing
  - d. The chalky powder on the surface of the metal

- \_\_\_\_\_ 7. Battery compartments are protected from corrosion by:
- a. Grounding the battery
  - b. Hermetically sealing the compartment
  - c. Checking electrolyte daily
  - d. Using acid proof paints and proper venting
- \_\_\_\_\_ 8. Aircraft steel tubing is protected from corrosion internally by:
- a. Hot line oil or linseed oil
  - b. Covering with fabric
  - c. Cadmium plating
  - d. Rosette welding
- \_\_\_\_\_ 9. A round bulge appearing in the aluminium surface is an indication of:
- a. Fretting corrosion
  - b. Paint blistering
  - c. Intergranular corrosion
  - d. Air bubble
- \_\_\_\_\_ 10. How would you determine the proper paper cleaning agent for a certain job?
- a. A-C-65-9
  - b. A-C-43-13-1
  - c. Manufacturer's standard processes
  - d. F.A.R. Part 145
- \_\_\_\_\_ 11. What is to be used as the authority for making metal skin repairs?
- a. F.A.R. A-C-65-9
  - b. F.A.R. 43-13-1
  - c. A-C-65-15
  - d. Manufacturer's structural repair manual for the aircraft
- \_\_\_\_\_ 12. The size and shape of the patch is determined in general by the:
- a. Number of patches in the damaged area
  - b. Number of rivets required in the repair
  - c. Thickness of metal
  - d. Type of metal
- \_\_\_\_\_ 13. The metal patch which provides a good concentration of rivets within the critical stress area, eliminates dangerous stress concentration and is very simple to lay out and should be used whenever possible in the:
- a. Round patch
  - b. Flush patch
  - c. Rectangle patch
  - d. Elongated octagonal patch

- \_\_\_\_\_ 14. In aircraft construction a panel is:
- a. Any single sheet of metal covering
  - b. Any metal covering in the cockpit
  - c. Only found on aircraft bulkhead
  - d. A stringer repair
- \_\_\_\_\_ 15. The patch which is used because of the uniform distribution of rivets and where the direction of the stress is unknown or where it is known to change frequently is the:
- a. Elongated patch
  - b. Oval
  - c. Round
  - d. Square
- \_\_\_\_\_ 16. An offset formed on an angle strip to allow clearance for a sheet or an extrusion is called a:
- a. Spar
  - b. Joggle
  - c. Stringer
  - d. All of the above
- \_\_\_\_\_ 17. A joggle can be formed by:
- a. Cornice brake
  - b. Joggle blocks
  - c. Steel or aluminium dies
  - d. All of the above
- \_\_\_\_\_ 18. When using joggling dies for the first time, test them for accuracy on a:
- a. Piece of steel first
  - b. Piece of waste stock
  - c. Piece of plexiglass
  - d. Piece of aircraft fabric
- \_\_\_\_\_ 19. Where aerodynamic smoothness is required use the:
- a. Lap patch
  - b. Sealant repair only
  - c. Flush patch
  - d. All of the above
- \_\_\_\_\_ 20. Metal bonded honeycomb construction:
- a. Better able to withstand sonic vibrations
  - b. Low cost when compared with fastener and installation cost of conventional structures
  - c. Reduces the number of parts needed and greatly reduces sealing problems
  - d. All of the above



- \_\_\_\_\_ 21. Most of the damages to honeycomb assemblies result from:
- a. Flight loads
  - b. Ground handling
  - c. Sonic vibration
  - d. All of the above
- \_\_\_\_\_ 22. What is the simplest way to test for delamination?
- a. Destructive testing
  - b. Metallic ring test
  - c. Dye penetrate testing
  - d. All of the above
- \_\_\_\_\_ 23. What tool is used to remove damaged material from metal bonded honeycomb panels?
- a. Aviation snips
  - b. Micro-shaver
  - c. Pneumatically powered hand-operated-router
  - d. Air drill motor
- \_\_\_\_\_ 24. What is the maximum allowable depth for removal of damaged honeycomb core material?
- a. Minimum depth that will allow you to remove all the damage
  - b. One inch beyond the damaged area
  - c. Only 1/2 of the damaged core material
  - d. There is no set allowable depth
- \_\_\_\_\_ 25. How many layers of glass fabric cloth are required in the repair of the flat surface of a metal bonded honeycomb panel?
- a. Three layers of number 181 glass fabric cloth
  - b. One layer of number 181 glass fabric cloth
  - c. Two layers of number 181 glass fabric cloth
  - d. Four layers of number 181 glass fabric cloth

# ANSWER KEY TO QUINMESTER POSTTEST

1. c
2. c
3. d
4. a
5. b
6. b
7. d
8. a
9. c
10. c
11. d
12. b
13. d

14. a
15. c
16. b
17. d
18. b
19. c
20. d
21. d
22. b
23. c
24. a
25. c